Thomas Cole Esqr.
with the respects of
J P Hall

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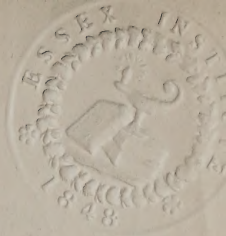

A

SYSTEM

OF

ASTRONOMY,

ON THE

COPERNICAN OR TRUE PRINCIPLE;

WITH TABLES,

CONTAINING

THE MEAN RIGHT ASCENSION OF THE SUN:

AND THE

RIGHT ASCENSION AND DECLINATION OF THE STARS,

Corrected to January, 1844.

ACCOMPANIED WITH A MAP,

UPON

THE GLOBULAR AND MERCATOR PROJECTION;

ON WHICH IS DELINEATED THE SITUATION OF THE PRINCIPAL PART OF THE STARS OF THE FIRST, WITH A PORTION OF THOSE OF THE SECOND AND THIRD MAGNITUDE;

AND SHOWING AT ONE SIGHT THE RISING AND COMING TO THE MERIDIAN OF EACH SIGN, CORRESPONDING TO THE FIRST DAY OF EACH MONTH OF THE YEAR.

SHOWING ALSO

THE PLACES OF THE PLANETS FOR JUNE 30TH, 1844;

AND THE

PATHS OF THE MOON, PLANET VENUS AND SUN.

ALSO,

THE DIRECT PATH OF THE COMET OF 1843.

ILLUSTRATED AND MADE PLAIN TO THE LEARNER,

BY J. P. FELT.

SALEM:

PRINTED BY IVES & PEASE.....OBSERVER OFFICE.

1845.

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INTRODUCTION.

Before entering upon an explanation of the Celestial Map, accompanying this pamphlet, it may be well to say something in regard to the Solar System and the Stars passing over us every twenty-four hours.

The Solar System, though great in itself, is small in comparison with the immensity of the universe. In viewing the vast bodies called fixed stars, we find among those distinguished by the naked eye, some appearing equal in brilliancy to the planets Mars and Jupiter, viz: Sirius, Lyra, Capella, Arcturus, and some others.

But a remarkable property of the fixed stars is, that their change in situation with regard to each other is so very small, that for ages it cannot be perceived. There is among them some small difference in their annual right ascension and declination. The motion in right ascension is called direct motion, being from West to East, and counts from 0 to 24 hours. The declination counts from the Equator to ninety degrees, or from the Equator to the Pole.

Fixed Stars are those which appear always to remain at the same distance from each other, and in the same relative position, while the Planets are continually in motion, with different velocities.

Of the Stars of the first magnitude, there are but about twenty; of those of the second, about fifty; and of the third, about three times the number of the latter. The number of smaller stars is innumerable, and with the help of telescopic power many new ones are presented to the eye.

The Planets placed in the Map are those only seen by the naked eye.

There are nine Stars, Arietis, Aldebaran, Pollux, Regulus, Spica, Artcurus, Aquila, Fomalhaut and Pegasi, which

have been selected by Astronomers in Europe for lunar purposes. Their distances from the Moon, at certain times, have been calculated and introduced into the Nautical Almanack, a publication issued yearly by the British Government, and for some years in advance. This enables the Navigator to deduce his longitude with great precision, by means of an admeasurement with the sextant or quadrant.

In 1834, for the first time, the distances between the Moon and four of the Planets, viz: Venus, Mars, Jupiter and Saturn, were introduced into the Nautical. The distance between the Sun and Moon has been given from the commencement of its publication in 1766, to the present time.

The Lunar Observations are of vast importance to the Navigator. The working of them has been so simplified by Dr. Bowditch and others, that every Navigator may with a little practice acquaint himself with taking and working them, and those who make use of them are enabled to obtain their longitude, whenever the Chronometer, a piece of mechanism of delicate work, but of great worth and utility, may get out of order and deceive, as has often happened.

It is recommended by writers on Astronomy, as being of great importance, in acquiring a clear idea of Astronomy and of the Phenomena of the Heavens, that the student should view with his own eyes the aspect and revolution of the celestial bodies, and have a good acquaintance with them before proceeding to an investigation of the real motions and arrangements which the discovery of science have unfolded. It is also said that it would be the best method of studying Geography, if the extension of Geographical knowledge, gradually produced by travellers from the time of Moses, could be brought before the youthful understanding in an hydrographical description, and as this observation will apply in part to the study of Astronomy, as well as to Geography, I am induced to hope that the Celestial Map, now presented to the public, may partake in part of the above recommendations, and with the explanation given, be the means of simplifying the Study of the Science of Astronomy, which it has been my aim to make plain and easy to the learner.

EXPLANATION OF THE CELESTIAL MAP.

This Map is constructed upon the principle of Mercator's projection, giving an apparent view of the Heavens. A line representing the Celestial Equator, divides the Northern from the Southern Hemisphere, in which are delineated the principal part of the Stars of the first, and some of the second and third magnitudes. There are also exhibited

The apparent path of the Sun, or true path of the Earth;

The path of Venus in the year 1843;

The path of the Moon during one revolution round the Earth;

The path of the Comet of 1843, from February 27th, on which day it passed the Sun, until April 9th, a period of forty-one days, during which time it travelled ninety degrees in Right Ascension through the Heavens.

On the right hand side of the Map are placed the twelve Signs of the Zodiac, with their names. Each Sign contains thirty degrees; giving in all the three hundred and sixty degrees of the circle. On the left hand side are marked the twelve Signs and the twenty-four hours of Right Ascension. Each hour contains fifteen degrees, giving in all, also, the three hundred and sixty degrees, as before.

Above the Map, at the right hand side, is a Globular View of the Sun and Planets, with the hours of Right Ascension, representing the Copernican or true system of the Universe, the Sun being placed in the centre, with the Planets revolving around him. The left hand Globular View, is the apparent view of the Heavens, with the Sun and Planets as seen from the Earth, corresponding with that of the Mercator projection.

The first Sign, Aries, corresponds with a month commencing the 20th March and ending the 20th April. But

in placing the names of the months, at the left hand, I have placed January and September in the space occupied by the first Sign, viz: from the twenty-fourth hour to the second line, or hour which denotes that the first of that sign reaches the Meridian at 5 hours 20 minutes in the evening, of the first of January, and that the same Sign rises at 7 hours 20 minutes in the evening of the first of September, and so on for all the other months in the year, one Sign, or thirty degrees of space in the Heavens, being two hours in passing the meridian of any place.

In naming the time of the Stars rising and reaching the meridian, I have taken the mean number of minutes for the twelve months, some being a few minutes before, and some a few minutes after the time mentioned.

It may be observed that each sign or star rises and reaches the meridian, three minutes and fifty-six seconds earlier each evening than it did on the preceeding one.

The above mentioned calculations for rising and reaching the meridian, are made for that part of the sign, which is at the Equator, while that part distant from the Equator, will be sooner or later, in doing so, according to the situation of the observer, whether in the same or opposite latitudes. For instance, the first sign at the Equator will be observed by a person in lat. 42° 30′ N. to rise at seven hours and twenty minutes in the evening; while the star Andromeda being at the commencement of the first sign, with a declination of 28° 15′, will rise at five hours and twenty minutes in the evening; and a star with the same right ascension and a declination of 28° 15′ S. will rise at nine hours and twenty minutes.

In order to have a right comprehension of the Map and its divisions, every one should understand that a line round the Heavens, commencing at the first of Aries, and terminating at the same, is called the line of Right Ascension, as one round the Earth, is called a line of longitude. They each contain three hundred and sixty degrees. This line Astronomers have divided into twelve signs, each containing thirty degrees. They have also subdivided these signs into two hours, each hour containing fifteen degrees, mak-

ing twenty-four hours and three hundred and sixty degrees.

In the catalogue of the Stars, contained in Bowditch's Practical Navigator, which gives Right Ascension and Declination for the year 1800, the star in the head of Andromeda, of the second magnitude, is marked 23 hours, 58 minutes, 4 seconds, with an annual variation in right ascension of 3″ 07-100, which being continued to the year 1844, places that star at 0h. 0m. 18s. or the commencement of the first sign Aries, this first sign being the starting point of Astronomers.

Andromeda is now of course the first star in Aries; and nearly South from it, fourteen degrees distance, lies the star Algenib; West from Algenib, about fourteen degrees, lies the star Pegasi; North from Pegasi, nearly thirteen degrees, lies the star in the shoulder of Pegasus; and about East from this latter star, nearly sixteen degrees, lies Andromeda;—the four stars when on or near the meridian forming an irregular square, with sides from about thirteen to sixteen degrees in length. West from the star in the shoulder of Pegasus, about four degrees, is a star nearly of the same magnitude; and South West from it, three degrees, are two small stars distant from each other about half a degree. Southwest from Pegasi, about four degrees, are two small stars about three quarters of a degree from each other.

The first of August, in lat. 42° 30′ N. Andromeda will rise in the evening at 7 hours 20 minutes, and together with Algenib, Pegasi, and the Star in the shoulder of Pegasus, may be seen in the East, in the evening at about nine o'clock, to have attained the height of about thirty degrees from the horizon, at which time they will form a figure corresponding to a diamond;—Andromeda being at the North point, Pegasus at the South, Algenib at the East, and the Star in the shoulder of Pegasus at the West.

In the month of September, at 7 o'clock in the evening, these Stars will have attained the same height as seen at nine o'clock in August, and will continue to be seen rising in the evening from that time until the first day of January. Andromeda and Algenib will then reach the meridian

at 5 hours 20 minutes, and Pegasi will have passed the meridian about one hour or fifteen degrees, at which time, as above mentioned, they will form nearly a square. After the first of January, they will be seen in the evening gradually approaching the western horizon in the same length of time, and of the same form that they have been seen rising or ascending the meridian from the East.

I have been thus particular in describing these stars, as they are at and about the first of Aries, and reach the meridian at an early hour in the evening at the commencement of the year. With them, well ascertained, the learner may be considered as having a starting point for finding the other stars in a course round the Heavens. With Andromeda identified and used as a departure or starting point, a course East by South, about twenty-seven degrees distance, will reach Arietis, a star of the second magnitude, which may be known by two small stars of about the fifth magnitude, lying four degrees South-West from it.

From Arietis, nearly due East, at a distance of twenty-three degrees, lie the Pleiades or Seven Stars, so called, though there are but six of them. From the Pleiades, South-East by East, nearly fourteen degrees, lies the brilliant star Aldebaran, called also Tauri and the Bull's Eye. It is of a reddish hue, of the first magnitude, and placed at the foot of the lower leg of a figure corresponding to the letter A lying upon its side. Nearly North by East from Aldebaran, thirty-one degrees, is the bright star Capella of the first magnitude, and of great brilliancy. From Aldebaran also nearly South-East, at the distance of twenty-three degrees, will be seen three small stars of the fifth magnitude, in a line nearly North-West and South-East from each other. These make the Belt of Orion, and are situated nearly upon the Celestial Equator. The three are also distinguished by the names of "Ell, and Yard." They are situated near the centre of the constellation of Orion. Nearly South from the Belt, and at a short distance, are three very small stars, almost on a straight line, called the Sword. South-West by South from the Belt, at about nine degrees, lies the star Rigel Orionis, and North-East

by North from the Belt, at ten degrees, lies the star called the Eastern Shoulder of Orion or Betelgeux, and about West by South from the latter, eight degrees, lies the Western Shoulder of Orion, or Bellatrix, the three latter being of the first and second magnitudes. The constellation Orion is the most splendid in the whole circumference of the Heavens, and so much was it noticed by the ancients, that mention is made of it in the Old Testament, in the books of Job and Amos.

South-East from the Belt, at a distance of twenty-three degrees, lies Sirius or the Dog Star, of the first magnitude, and of a brilliancy nearly equal to that of the Planet Jupiter.

Sir John Herschel, the great English Astronomer, says, that by experiments that he made, he found the light of Sirius is about 324 times that of an average of all the stars of the fifth magnitude.

From Sirius, North-East by North, at a distance of about twenty-six degrees, lies the star Procyon, nearly North from which, twenty-three degrees, lies the star Pollox, and North-West by North from Pollox, about four and two third degrees, lies the star Castor,—the last two are frequently called the Twins. Sirius with Procyon and the Eastern Shoulder of Orion form an equilateral triangle, two sides being twenty-six degrees, and the other twenty-seven.

Sirius and Aldebaran bear North-West and South-East from each other, and their distance is forty-six degrees.

From Procyon, in the direction of East by North, about thirty-six degrees, lies the star Regulus, which with several of the neighboring stars form a figure corresponding to the Sickle, Regulus being placed in the handle.

East South-East from Regulus, at the distance of fifty-four degrees, lies the star Spica, of the first magnitude. There is no bright star near it, and it may be known by its having, in a South-West direction, at a distance of about fifteen degrees, five stars of the third and fourth magnitude; from Regulus also, nearly East by North, twenty-five degrees, lies Denebola.

North North-East from Spica, at a distance of thirty-

three degrees, lies the star Arcturus., of the first magnitude. From Spica, East South-East, at a distance of forty-six degrees, lies the star Antares, of the first magnitude, of a reddish hue; on each side of which, at a small distance, lies a star of the fourth magnitude; the three forming an angle slightly oblique; West of which, at a small distance, are three stars, in a line nearly North and South with each other. From Antares, about North North-East, at a distance of seventy-two degrees, lies Lyra, a star of very great brilliancy. From Antares, also, about North North-East, forty-two degrees, lies the star Ophiuchus, and from Ophiuchus, North-East by North, at a distance of thirty degrees, lies Lyra, which bears from Aquila North-West by North, forty degrees distance. From Lyra, East by North, twenty-four degrees, lies the star Deneb, or Cygni, South-East by South from which, at a distance of ten degrees, is a star of the fifth magnitude, called in the catalogue of the stars contained in the Nautical Almanac 61 Cygni. This star has recently become of much note, in consequence of a successful attempt by Mr. Bessel, a German Astronomer, to measure its distance from the Earth.

The following extract is taken from an address delivered by Sir John Herschel, before the Royal Astronomical Society, London:

"It is an immense accession to our knowledge, to have measured the distance of a single star. I congratulate you and myself that we have lived to see the great and hitherto impassable barrier against which we have chafed so long and so vainly, thus fairly overleaped. It is the greatest and most glorious triumph which practical astronomy has ever witnessed."

Mr. Bessel found the distance to be five hundred and ninety-two thousand times the Earth's distance from the Sun.

From Antares, North-East by East, at a distance of sixty degrees, lies the star Aquila; North North-West from which, at two degrees distance, and South South-East of it, three degrees distance, are stars of the fifth magnitude, forming a straight line with it. South-East from Aquila, sixty degrees, lies the star Fomalhaut, with a Southern

declination of thirty degrees. Nearly North from Fomalhaut, about forty-five degrees, and East by North from Aquila, at a distance of forty-eight degrees, lies the star Pegasi, which forms the South-West corner of the Square, of which Andromeda forms the North-East corner. On reaching this star, a passage round the whole heavens has been performed, and we have returned to the place started from.

In the construction of this Map, it was found most convenient to have the top represent the East and the left hand the North.

In consequence of the Mercator Map being a rectilinear, instead of a globular projection, and the nearness of the North Star to the Pole, it becomes necessary to give that star a different situation in Right Ascension from the true, in order that it shall conform to the Pointers.

In projecting the Mercator Map, I have done it as if upon a plane seen direct, in preference to seeing it overhead, that being a very awkward position in which to view it.

In the North is seen the North or Pole Star, which has, revolving around it, a cluster of stars called the "Great Bear," "Charles Wain," or the "Dipper." The distance between the Pole Star and the nearest Pointer, is nearly thirty degrees.* As the Great Bear never goes below the horizon, in lat. 42 30 N. it is seen to pass the upper and lower meridian at different seasons of the year. In October, it may be seen passing the lower meridian, and in April, it may be seen passing the upper meridian, in the evening, six months, corresponding to twelve hours in Right Ascension.

In high Southern latitudes, are seen the stars Canopus, the Eastern and Western foot of the Centaur, and the stars of the Cross, all of the first and second magnitude, and more or less used by Navigators in South latitude, for the purpose of finding the latitude of the place or the time of

* The "Pointers" are but two of the revolving stars—at one extremity of which are two stars called the Pointers, because they point to the North Star.

the ship. They are too far South to be seen in lat. 42° 30′ N. even when they are on the meridian.

Stars whose declination are less than the complement of the latitude of the place, rise and set every natural day; but those stars, whose declination is of the same name with the latitudes, and greater than its complement, neither rise nor set, but are continually above the horizon, or within the circle of perpetual apparition. Stars, whose declination are of a contrary name to the latitude, and greater than its complement, are always below the horizon, or within the circle of perpetual occultation.

It may here be observed, that the complement of the latitude of a place is what shall remain after deducting the latitude from 90°; for example, the latitude of 42° 30′ deducted from 90 leaves 47° 30′ as its complement.

The Right Ascension and Declination of the Planet Mercury, are here given for the first of each month of the year 1845. It may not be exactly correct, yet is sufficiently so for marking its situation on the Map. Mercury being so near the Sun is rarely seen by the naked eye.

	Right Asc'n.	Declination.			Right Asc'n.	Declination.	
	H. M.	H. M.			H. M.	H. M.	
Jan'y 1	20 08	20 23	S.	Aug. 2	10 25	10 07	
Feb'y 3	19 28	21 12		Sept. 1	11 41	2 45	S.
March 2	22 04	14 28	S.	Oct. 1	11 21	4 31	N.
April 1	1 25	8 59	N.	Nov. 3	14 27	17 01	S.
May 1	3 11	19 49		Dec. 3	17 38	25 50	
June 3	2 59	14 19		Dec. 30	18 06	20 18	
July 3	6 38	24 15					

TABLE I.

List of Stars, contained in the Mercator Map, showing their Right Ascension and Declination, adapted to the Year 1844.

No.	NAMES OF STARS.	Magnitude.	Right Ascension.	Declination.
			H. M. S.	° ′
1	Andromeda	2	0 0 18	28 15 N.
2	Algenib	2	0 5 12	14 19 N.
3	Bright Star in the Whale	2.3	0 34 12	18 50 S.
4	Polar Star	2.3	1 1 25	88 29 N.
5	In the girdle of Andromeda	2	1 1 00	34 37 N.
6	Achernar in Eridani	1	1 31 55	58 8 S.
7	Almaach	2	1 54 20	41 35 N.
8	Arietis	2	1 58 22	22 43 N.
9	In the Neck of the Whale	2	2 11 28	3 42 S.
10	Ceti in the Jaw of the Whale	2	2 54 07	3 28 N.
11	Algol	2	2 58 01	40 22 N.
12	Bright Star in Persei	2	3 13 11	49 18 N.
13	Bright Star in the Pleiades	3	3 38 13	23 37 N.
14	Aldebaran	1	4 27 00	16 12 N.
15	Capella	1	5 5 10	45 50 N.
16	Orion Rigel	1	5 7 02	8 25 S.
17	Tauri, Northern Horn of the Bull	2	5 15 41	28 28 N.
18	Orion, Western Shoulder	2	5 18 46	6 12 N.
19	Belt of Orion	2	5 24 08	0 55 S.
20	Belt of Orion	2	5 28 17	1 18 S.
21	Belt of Orion	2	5 32 54	2 2 S.
22	Bright Star in the Dove	2	5 34 00	34 11 S.
23	Orion, Eastern Shoulder	1	5 47 04	7 22 N.
24	In the foot of the Great Dog	2.3	6 16 00	17 53 S.
25	Canopus	1	6 20 30	52 37 S.
26	Sirius	1	6 38 17	16 31 S.
27	Canis Majoris	2.3	6 52 30	28 46 S.
28	In the back of Great Dog	2.3	7 2 02	26 7 S.
29	In the tail of Great Dog	2	7 18 00	28 59 S.
30	Castor	1.2	7 24 39	32 13 N.
31	Procyon	1.2	7 31 07	5 37 N.
32	Pollox	1.2	7 35 45	28 24 N.
33	Alphard	2	9 20 00	7 58 S.
34	Regulus	1.2	10 00 03	12 44 N.
35	South Pointer in square of Great Bear	2	10 52 52	57 12 N.
36	North Pointer in do. of do.	1.2	10 54 06	62 36 N.
37	Denebola	1.2	11 41 05	15 27 N.
38	S. East Star in square of Great Bear	2	11 45 36	54 34 N.
39	N. East Star in do. of do.	3	12 7 40	58 08 N.
40	In the foot of the Cross	2	12 18 00	62 14 S.
41	In the top of the Cross	2	12 22 32	56 14 S.
42	Arm of the Cross	2	12 39 00	58 34 S.
43	Alioth, 1st star in tail of Great Bear	2.3	12 47 14	56 59 N.
44	Spica	1	13 17 00	10 20 S.
45	Second Star in tail of Great Bear	2.3	13 17 37	55 40 N.
46	Last Star in do. of do.	2	13 41 25	50 06 N.

TABLE I.

List of Stars, contained in the Mercator Map, showing their Right Ascension and Declination, adapted to the Year 1844.

No.	NAMES OF STARS.	Magnitude.	RIGHT ASCENSION. H M. S.	DECLINATION. ° ′
47	Western foot of the Centaur	2	13 53 00	59 37 S.
48	Arcturus	1	14 08 32	20 00 N.
49	Eastern foot of Centaur	1	14 29 48	60 11 S.
50	Gemma	2	15 28 04	27 17 N.
51	Neck of the Serpent	2	15 36 35	6 57 N.
52	North Star, in Scorpion's forehead	2	15 56 22	19 22 S.
53	Antares	1	16 19 50	26 05 S.
54	Hercules	2	17 07 32	14 34 N.
55	Ophiuchus	2	17 27 41	12 41 N.
56	Draconis	2.3	17 53 00	51 30 N.
57	Lyra	1	18 31 38	38 38 N.
58	Aquila	1	19 43 30	8 28 N.
59	In the tail of the Swan Deneb	1.2	20 36 08	44 43 N.
60	61 Cygni	3	21 00 00	38 00 N.
61	Western wing of the Crane	2	21 58 13	47 43 S.
62	Fomalhaut	1	22 49 01	30 27 S.
63	In the shoulder of Pegasus	2	22 56 11	27 15 N.
64	Pegasi	2	22 57 00	14 22 N.

The following is the rule for finding when a Star will be on the meridian :—

Find the right ascension of the Sun in Table II ;—subtract the Sun's right ascension from the Stars found in Table I,—having previously increased the latter by 24 hours, when the Sun's right ascension is the greatest,—the remainder will be the time of the Stars coming to the meridian. If the remainder be greater than 12 hours, the star will come on the meridian after midnight, but if less than 12 hours the star will come on the meridian before midnight.

EXAMPLES.

What time will the Star Adromeda be on the meridian, April 1st, 1845 ?

	H.	M.
Andromeda's right ascension	0	0
Add	24	0
Subtract Sun's right ascension		41
	23	19
Subtract to midnight	12	
In the morning or A. M.	11	19

What time will the Star Regulus be on the meridian, May 1st, 1845 ?

	H.	M.
Star's right ascension	10	00
Subtract Sun's right ascension	2	32
Regulus on the meridian P. M.	7	28

What time will Aldebaran be on the meridian, April 1st, 1845 ?

	H.	M.
Aldebaran's right ascension	4	27
Subtract Sun's right ascension		41
On the meridian or souths at	3	46

What time will the Star Antares be on the meridian, July 4th, 1845?

	H	M
Antares right ascension	16	20
Subtract Sun's right ascension	6	51
Antares on the meridian	9	29

TABLE II.

The Cycle of the Sun is a period of 28 years, and brings the days of the week to the same days of the month, the Sun to the same signs, and degrees of the Ecliptic, with little variation in each succeeding period. As the variation of years, compared with each other, is so small, the following Table of the Mean Right Ascension of the Sun in hours and minutes, is sufficiently near for finding the time of a Star coming to the meridian for common purposes; but if, at any time, greater accuracy is required, reference may be had to the Nautical Almanack, and the United States Almanack, where the Right Ascension is given for every day in the year, in hours, minutes and seconds.

Days	JAN	FEB.	MAR.	APR.	MAY	J'NE	J'LY	AUG.	SEPT	OCT.	NOV.	DEC	Days
	h. m.	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	*h. m.*	
1	18.45	20.57	22.48	0.41	2.32	4.35	6 39	8.44	10.40	12.28	14.24	16.28	1
2	18.49	21. 1	22.51	0.45	2.36	4.39	6.43	8.48	10.44	12.32	14.28	16.33	2
3	18.54	21. 6	22.55	0.48	2.40	4.43	6.47	8.52	10.47	12.36	14.32	16.37	3
4	18.58	21.10	22.59	0.52	2.44	4.47	6.52	8.56	10.51	12.39	14.36	16.41	4
5	19. 3	21.14	23. 2	0.56	2.48	4.51	6.56	8.59	10.55	12.43	14.40	16.46	5
6	19. 7	21.18	23. 6	0.59	2.51	4.55	7. 0	9. 3	10.58	12.46	14.44	16.50	6
7	19.11	21.22	23.10	1. 3	2.55	4.59	7. 4	9. 7	11. 2	12.50	14.48	16.54	7
8	19.16	21.26	23.14	1. 7	2.59	5. 4	7. 8	9.11	11. 5	12.54	14.52	16.58	8
9	19.20	21.30	23.17	1.10	3. 3	5. 8	7.12	9.15	11. 9	12.57	14.56	17. 3	9
10	19.24	21.34	23.21	1.14	3. 7	5.12	7.16	9.19	11.13	13. 1	15.00	17. 7	10
11	19.29	21.38	23.25	1.18	3.11	5.16	7.20	9.22	11.16	13. 5	15. 4	17.12	11
12	19.33	21.41	23.28	1.21	3.15	5.20	7.24	9.26	11.20	13. 8	15. 8	17.16	12
13	19.37	21.45	23.32	1.25	3.19	5.24	7.28	9.30	11.23	13.12	15.12	17.21	13
14	19.42	21.49	23.36	1.29	3.23	5.28	7.32	9.34	11.27	13.16	15.17	17.25	14
15	19.46	21.53	23.39	1.32	3.27	5.33	7.36	9.37	11.31	13.20	15.21	17.30	15
16	19.50	21.57	23.43	1.36	3.30	5.37	7.40	9.41	11.34	13.23	15.25	17.34	16
17	19.55	22. 1	23.47	1.40	3.34	5.41	7.45	9.45	11.38	13.27	15 29	17.38	17
18	19.59	22. 5	23.50	1.43	3.38	5.45	7.49	9.49	11.41	13.31	15.33	17.43	18
19	20. 3	22. 9	23 54	1.47	3.42	5.49	7.53	9.52	11.45	13.35	15.37	17.47	19
20	20. 7	22.13	23.58	1.51	3.46	5.53	7.57	9.56	11.49	13.38	15.41	17.52	20
21	20.12	22.16	0. 1	1.55	3.50	5.58	8. 1	10. 0	11.52	13.42	15.46	17.56	21
22	20.16	22.20	0. 5	1.58	3 54	6.02	8. 5	10. 4	11.56	13.46	15.50	18. 1	22
23	20.20	22.24	0. 8	2. 2	3.58	6.06	8. 9	10. 7	11 59	13.50	15.54	18. 5	23
24	20.24	22.28	0.12	2. 6	4. 2	6.10	8.13	10.11	12. 3	13.54	15.58	18. 9	24
25	20.28	22.32	0.16	2.10	4. 6	6.14	8.17	10.15	12. 7	13.57	16.02	18.14	25
26	20.33	22.35	0.19	2.13	4.10	6.18	8.20	10.18	12.10	14. 1	16. 7	18.18	26
27	20.37	22.39	0.23	2.17	4.14	6.22	8.24	10.22	12.14	14. 5	16.11	18.23	27
28	20.41	22.43	0.27	2.21	4.19	6.27	8.28	10.26	12.17	14. 9	16.15	18.27	28
29	20.45	22.45	0.30	2.25	4.23	6.31	8.32	10.29	12.21	14.13	16.20	18.32	29
30	20.49		0.34	2.28	4.27	6.35	8.36	10.33	12.25	14.17	16.24	18.36	30
31	20.53		0.37		4 31		8.40	10.37		14.21		18.41	31

TABLE III.

The Right Ascension and Declination of four of the Planets, for 1845 are here given, twice for each month, which will enable the learner to place them upon the Map, in order to see their situation at a given time, as they are continually in motion.

DATE.	VENUS.		MARS.		JUPITER.		SATURN.	
	Right Asce'n.	Declination.	Right Asc'n.	Declination.	Right Asc'n.	Declination.	Right Asc'n.	Declination.
	h. m.	° ′	h. m.	° ′	h. m.	° ′	h. m.	° ′
January 1	16.27	20.12 S	15.02	16.28 S.	23.51	2.19 S.	20.36	19.19 S.
15	17.14	21.53	15.26	18.03	23.56	1.45	20.40	19. 3
31	19.07	22.22	16.21	21.04	0.10	0.13 S.	20.50	18.26
Feb'ry 15	20.26	19.43	17.02	22.32	0.21	1.02 N.	20.57	17.58
28	21.32	15.40	17.37	23.18	0.32	2.12	21.03	17.34
March 15	22.44	9.29	18.18	23.36	0.44	3.35	21.10	17.08
31	23.57	1.52 S.	19.01	23.18	0.58	5.05	21.16	16.44
April 15	1.06	5.32 N.	19.40	22.28	1.12	6.28	21.21	16.24
30	2.15	12.30	20.17	21.15	1.25	7.48	21.24	16.10
May 15	3.28	18.21	20.51	19.49	1.38	9.04	21.26	16.03
31	4.50	22.34	21.24	18.16	1.51	10.18	21.27	16.03
June 15	6.10	24.07	21.49	17.04	2.03	11.19	21.26	16.09
30	7.30	23.00	22.08	16.25	2.14	12.11	21.24	16.22
July 15	8.48	19.23	22.18	16.35	2.22	12.53	21.20	19.40
31	10.06	13.20	22.16	17.43	2.30	13.26	21.16	17.02
August 15	11.14	6.18 N.	22.04	19.11	2.34	13.43	21.12	17.23
31	12.25	1.54 S.	21.48	20.09	2.35	13.47	21.07	17.43
Sept. 15	13.32	9.30	21.39	19.50	2.34	13.37	21.04	17.58
30	14.41	16.13	21.42	18.24	2.29	13.13	21.01	18.08
October 15	15.53	21.49	21 55	16.07	2.23	12.40	21.00	18.11
31	17.15	25.17	22.18	13.02	2.15	11.59	21.01	18.08
Nov. 15	18.32	25.53	22.45	9.39	2.07	11.22	21.03	17.58
30	19.47	23.52	23.14	5.56	2.01	10.53	21.07	17.42
Dec'r 15	20.55	19.38	23.46	2.00	1.57	10.38	21.12	17.20
31	21.57	13.30	0.21	2.17	1.57	10.39	21.18	16.52

THE SUN AND PLANETS.

The great French Astronomer La Place, imagines the Sun to be a burning body. This luminary, the great source of light and heat, appears to us a circular resplendant disk, from which appearance and from observations of the solar spots, it is considered as being of a spherical form. When measured with a sextant, it has an apparent diameter of 32, and a real diameter of 883,246 miles. It revolves upon its own axis in about 25½ days, a given spot on its surface being visible, and apparently moving from one side to the other in about 12¾ days, and being absent from the sight the same length of time.

The places of Mercury, Venus, Mars, Jupiter and Saturn, are given in the Map for June 30th, 1844. But they are continually changing their places, with different velocities. In order to find their situation at a given time, recourse may be had to pages 12 and 16 of this Pamphlet, and to the Nautical Almanac;—in the latter their Right Ascension and Declination is given for each day of the year.

The following may be added as regards the Primary Planets.

The Primary Planets, accompanied by their Moons, revolve about the Sun in Elliptical orbits, which have but little eccentricity, the Sun itself being situated in a focus common to all these ellipses.

The Primary Planets seen by us, are Mercury, Venus, Earth, Mars, Jupiter and Saturn; the others, requiring Telescopes to view them, are not noticed. All have their paths round the Sun at greater or less distances, and move with greater or less velocity. Mercury is nearest to the Sun, has a density equal to that of lead, and the greatest velocity. Saturn, placed at the greatest distance from the

Sun, except Herschel, not specially spoken of herein, has the least velocity of any of the Planets, and a density compared with that of the earth, as one to nine. His mean density is no more than the density of cork, and consequently the globe of Saturn, placed on water, would swim.

The Planets are in their motions governed by one uniform rule. They are solid bodies, not luminous in themselves, but shining merely by reflecting the light of the Sun.

The masses of the Planets, their magnitudes, and their motions, have all been determined with great accuracy, and the places they occupy at any proposed point of time, can be calculated with ease by one acquainted with practical Astronomy. Mercury and Venus are within the orbit of the Earth, and Mars, Jupiter and Saturn without.

Astronomers say that no improvement in modern Astronomy, can be compared to that of determining the magnitude and distance of the Planets, by the Transit of Venus across the Sun's disk. The transit of Venus happens but seldom. Two English gentlemen, by the names of Horrox and Crabtree, as far as is known, were the first who had a view of this important and interesting phenomenon. This was on the 24th November, 1639. But their observations were imperfect, the Sun going down in England during the transit. Mr. Horrox is also said to be the first who predicted the subsequent transit. He deduced many useful results from his observations, though he was not aware of the full advantage to be derived from them. He died January 3d, 1641, a few days after he had finished his treatise, entitled, "*Venus in Sole Visa.*" His theory of Lunar motions afforded great assistance to Newton, who always spoke of Horrox, as a mathematical genius of the highest order.

So much of Mr. Horrox's observations were obtained, as enabled that great English astronomer, Doctor Halley, (who was some years afterwards at St. Helena for the purpose of viewing the Stars in the Southern Hemisphere,) to make an accurate observation of the transit of Mercury

over the disk of the Sun. He immediately formed the idea that such a transit, might be used for finding the Sun's parallax. But Mercury being too near the Sun, he found it was necessary to have recourse to Venus, the next transit of which would take place on the 6th of June, 1761. Dr. Halley, in a paper communicated to the Royal Society at London, in 1691, seventy years before the appearance of the transit, gave particular directions for observing this and the following transit in 1769, though he knew that they must happen sometime after his death. He died in 1742, nineteen years before the transit took place.

The Rev. Mr. Bliss, who was Astronomer Royal at Greenwich in 1761, was the first in England to observe Venus on the disk of the Sun in that year. Doctor Maskelyne, an eminent English astronomer, was ordered in 1761 to proceed to St. Helena to observe the phenomenon there. On the death of Mr. Bliss, he became Astronomer Royal, and in 1767, commenced the Nautical Almanac, which has continued without interruption until this day.

Many observations in Europe, and various other parts of the world, were made of the transit in 1761, and the Sun's parallax was correctly obtained. However to make doubly sure, the English government despatched the celebrated Navigator, Captain Cook, to the Island of Tahita, in lat 37° 30′ South, and longitude 149° West, accompanied by Sir Joseph Banks, Doctor Solander, and others, to make the observation of the transit of Venus in 1769. They accomplished it, to do which they had fine weather and a clear sky, during their observation, and it resulted in confirming the observations of 1761, and made the mean distance of the Earth from the Sun, 95,173,117 miles.

Mr. Short, in London, took great pains in deducing the quantity of the Sun's parallax from the observations in Great Britain and abroad, and found it to be 8″ 52, on the day of the transit, when the sun was near its greatest distance from the Earth, making it consequently 8″.65 when the Sun is at its nearest distance from the Earth. From this, Mr. Furguson makes 23,883 the number, in semidiameter of the Earth, of the Sun's distance from the Earth,

and as he reckoned the semi diameter of the Earth at 3985 miles, by multiplying these together, he made the mean distance of the Earth 95,173,117 miles.

By the light of Science, the Astronomer confidently predicts that the Transit of Venus will occur again in 1874 and 1882, in 2004 and 2012, and again in 2117 and 2125, and calculates when they will commence and when terminate as seen at different parts of the Earth.

While some Astronomers by the Transit of Venus have determined the distance of the Planets from the Sun and from each other, others have made use of Jupiter and his Moons for the purpose of determining the situation of places upon the Earth.

In 1610, Galeilo, an Italian astronomer, was the first to discover the satellites of Jupiter, and Mr. Beadly, Astronomer Royal, in 1726, explained the method of obtaining longitude, by the means of the Eclipses of Jupiter's Satellites. In 1774, Dr. Maskelyne was employed in making observations on the Eclipses of the Satellites of Jupiter, which were introduced by him into the Nautical Almanac, and are continued to this day.

Mars, with Jupiter, Venus and Saturn were introduced into the Nautical Almanac, for the first time in the year 1834, for the purpose of finding the longitude, by means of lunar distances between them and the Moon, similar to the distances between the Stars and Moon.

Mercury, being so near the Sun, can be seen only for a short time during its greatest Eastern and Western Elongations, the greatest extent of which is only 28°, and it is rarely seen under half that distance by the naked eye.

I add a Table of the Diameter, Motions and Periods of the Planets.

A TABLE

Of the DIAMETER, PERIODS, *&c. of the several* PLANETS, *in the* SOLAR SYSTEM.

NAMES OF PLANETS.	Annual Period round the Sun.		Diameters	Diurnal Revolution on its axis.	Distance from the Sun.	Diameter of Orbit.	Circumference of Orbit.	Number of Miles to a Degree.	Daily Motion.	Hourly Motion.
	Years.	Days.	Miles.	H. M. S.	Miles.	Miles.	Miles.		° ′ ″ ‴	
MERCURY.....		88	3,180	24. 5.08	37,000,000	74,000,000	232,571,428	646,031	4.05.33	110,000
VENUS.....		224	7,687	23.20.59	68,000,000	136,000,000	427,428,511	1,127,301	1.36.08	79,153
EARTH.....		365	7,964	23.56.04	95,000,000	190,000,000	597,142,857	1,658,730	59.08.19¾	68,000
MARS.....	1	321	4,189	24.40.00	144,000,000	288,000,000	905,285,714	2,514,285	31.27	55,000
JUPITER.....	11	315	89,170	9.55.56	490,000,000	980,000,000	3080,000,000	8,555,555	4.59	29,607
SATURN.....	29	162	79,042	10.16.00	900,000,000	1800,000,000	5657,142,857	15,714,256	2.01	22,000
VESTA.....	3	228	270		225,000,000	450,000,000	1414,285,714	3,095,238	14.39	44,000
JUNO.....	4	128	1,425		254,000,000	504,000,000	1596,000,000	4,433,333	13.36	41,850
CERES.....	4	220	1,624		263,000,000	526,000,000	1653,142,857	4,592,063	12.51	41,000
PALLAS.....	4	220	2,099		265,000,000	530,000,000	1665,714,286	4,626,983	12.45	41,000
HERSCHEL...	83	305	35,112		1800,000,000	3600,000,000	11314,285,714	31,428,571	41	15,000

The Elements of the Planets Vesta, Juno, Ceres, Pallas and Herschel, not specially noticed in this work, are added to this Table.

SUN AND EARTH.

The Sun is placed in the centre of his system, diffusing his influence upon all the Planets, and although *he remains in the same place*, he is not perfectly at rest, but moves continually round his own axis from West to East, making one revolution in about twenty five and an half days. He is the only lucid body in the solar system, affording light and heat to all the rest, and is much larger than any of them, his diameter being about 880,000 miles. The mass of the Sun exceeds that of all the Planets eight hundred times and is about three hundred and thirty thousand times heavier than the earth. The solar diameter exceeds that of the Earth one hundred and twelve times and its surface exceeds the surface of the earth, twelve thousand seven hundred times, being estimated at one million three hundred thousand times larger than the Earth.

The Earth being distant from the Sun about ninety five millions of miles, in revolving in its orbit round the sun, describes a circle, the diameter of which is one hundred and ninety millions of miles, and a circumference of nearly six hundred millions miles, which being performed in 365 days, gives over a million and an half miles a day, and over sixty eight thousand miles per hour.

The Sun, when on the meridian, is used by navigators to obtain the latitude, to find the time of the ship from an altitude observed, when rising or declining, and for ascertaining the longitude by means of the admeasurement of the Moon's distance from him. His right ascension, declination, and semi-diameter for great exactness, is given in the Nautical and Downe's United States Almanacks for each day of the year for the use of Navigators and others.

It is found by admeasurement with the sextant that the Sun measures an apparent mean diameter of thirty two

miles, which represents the real diameter of 880,000 miles. So that an apparent degree at the Sun is actually over one million six hundred and fifty thousand miles. The horizontal parallax of the Sun has been known with great accuracy since the transit of Venus over the Sun's disk in 1761 and 1769.

As the orbit of the Earth includes that of Mercury and Venus, these planets must sometimes appear between us and the sun, and the duration of such a transit for the centre of the Earth may be calculated, and on comparing this with the duration actually oberved on the surface of the Earth, the difference of the two results enables us to deduce the horizontal parallax of the Sun, and hence the distance of the two luminaries. In this way, the mean horizontal parallax of the Sun has been estimated by the French Astronomer, Durejour, at 8″.8 which makes the mean distance of the Sun from the Earth, to amount according to Furguson to 23,439 times the Radius of the Earth, (which is about 4000 miles), or in round numbers, about ninety four millions of miles. It is upon this principle that the distances of the heavenly bodies have been measured, and is the same principle used by Navigators in working the course and distance from one head land to another. Respecting the physical structure of the Sun Astronomers differ, the Sun being, according to Mr. Herschel, an opaque body. His theory is now universally admitted.

The Earth was long considered as an extensive plane. More accurate observations however show that the Earth is of a globular form or figure, and has a diurnal or daily motion on its axis, which it performs in 23 hours, 56 minutes, and 4 seconds, and an annual motion round the Sun which it performs in 365 days, 5 hours and 49 minutes, also its inclination of about 23½ degrees, the latter causing the different seasons and different lengths of the days and nights.

An imaginary line round the centre of the Earth which is called the Equator, divides the Northern from the Southern latitudes. This line is divided into 360 equal parts,

called degrees of longitude, which is usually reckoned from a meridian counting 180 degrees East, and 180 degrees West Longitude. The English reckon from the meridian of Greenwich, and the French from the meridian of Paris; the American Navigators generally make use of the meridian of Greenwich, yet some charts have been constructed taking Washington as a meridian.

MOON.

Of all the Heavenly bodies, the Moon from its comparative proximity to the Earth, is the best known, its nearest approach being within about 220,000 miles, while its greatest distance is about 260,000 miles, giving a mean distance of about 240,000 miles. According as it is nearer to, or further from the Earth, its apparent diameter is larger or smaller The Moon turns round on its own axis, in the same time that it revolves round the earth, which it takes 29½ days to perform. It has an annual motion in company with the Earth round the Sun. Its motion in changing declination is sometimes 12 to 13 miles per hour. The moon's mean motion in her orbit, in each solar day of 24 hours, is 13°.10′.35″. But as the Earth moves in the Ecliptic at the same time 59′,8″, the apparent motion of the Sun, the Moon's mean motion from the Sun is 12°,11′, 27″. Any meridian of the Earth, in its diurnal rotation, moves this distance in 48 minutes, 46 seconds. At the Equator, therefore the Moon rises there about fifty and an half minutes later each succeeding day, at all times. The Moon is of great use to the Navigator, as by means of her distance from the Sun, Stars and Planets, he finds his longitude by lunar observations.

The cycle of the Moon is a period of about nineteen years, at the expiration of which, the changes, fulls, and

other aspects of the Moon, return to the same month and day of the month, or within a day of the same, as at the beginning. The various appearances which the Moon, periodically presents in different parts of its Revolution, are termed *Phases*, and arise from the different positions, which its opaque mass assumes in relation to the Sun and Earth. When the Moon is between the Sun and Earth, in which case the Sun and Moon are said to be in conjunction, it presents the unenlightened side to us, and we can see nothing of it. In this state it is called a new moon. Soon after, it recedes from the sun, and a small part of its illuminated surface becomes visible in the western horizon. Four days after the time of new moon, it has receded about 48 degrees from the Sun, and a portion of its illuminated surface is seen in the shape of a sickle. It continues, from day to day, to increase its distance from the Sun, moving in a direction from West to East, and therefore appears every evening nearer the Eastern horizon, and the sickle shape figure grows daily broader. Eight days from the time of the new moon it has departed over ninety degrees, and then shows a bright semicircular disk, called the first quarter. Departing continually further, the illuminated portion continually increases, assuming more and more of a circular figure; until about fifteen days after the time of new Moon, it stands directly opposite the Sun, being twelve hours in Right Ascension or 180 degrees from it. At this time, it presents a complete circular disk, rising when the sun sets, and shining the whole night through.

From the day of the full Moon, it decreases with each successive day, on the side most distant from the Sun, at the same rate as it before increased. In the course of seven or eight days it has again arrived within ninety degrees of the Sun, and now shows but half of its disk, and is said to be at the last quarter, continuing to show less and less of its illuminated surface, it finally assumes the sickle shape, rises later and later, and at the end of about 29½ days, from the time of new Moon, again comes into conjunction with the Sun, disappearing and commencing a new Revolution. She thus continues in her cycle, as men-

tioned above, for about nineteen years. As well before as after new Moon, the naked eye can discern a pale light on a portion of the disk not illuminated by the Sun. This is reflected from the Earth, for at this time, when it is most perceptable, the sun has not yet set in the afternoon, and in the forenoon, has been up for sometime.

Six hundred and forty years before the Christian era, the Chaldeans considered the Moon, as the smallest among the heavenly bodies. They knew that her light was borrowed from the Sun. They fixed her periodical phases, and attributed her Eclipses to the shadow of the Earth, as Astronomy has since confirmed. In modern times, the Moon has occupied much of the attention of Astronomers. Her various and irregular motions, cause the calculations of her movements to be very long and intricate, before they can be used by Astronomers and Navigators, to both of whom she is an object of the first importance.

Should the situation of the Moon be required at any time in order to mark it upon the map, the right ascension and declination for every day in the year, can be found in the Nautical and United States Almanac.

COMETS.

The following paragraphs, extracted from Arago and Lardner's Astronomy, may be considered as good authority as any at present before the public.

"By far the greater number of comets appear to be mere masses of vapour, totally divested of all concrete or solid matter. So prevalent is this character, that some observers hold it to be universal. Seneca mentions the fact of stars having been distinctly seen through comets. A star of the sixth magnitude was seen through the centre of the head of the comet of 1795, by Sir William Herschel, and in September, 1832, Sir John Herschel, when observing Biela's Comet, saw that body pass directly between his eye and a small cluster or knot of minute telescopic stars of the sixteenth or seventeenth magnitude. This little constellation

occupied a space in the heavens the breadth of which was not the twentieth part of the breadth of the moon; yet the whole of the cluster was distinctly visible through the comet. 'A more striking proof,' says Sir John Herschel, 'could not have been offered of the extreme translucency of the matter of which this comet consists.'"

"Nevertheless, Mr. Arago leans to the opinion, that some of the comets which have appeared have a solid nucleus within the nebulous matter which surrounds them. This opinion he grounds upon the intense splendor which has been imputed to several of the recorded comets, such for example, as in that which appeared in the year 43, B. C. and which the Romans considered to represent the metamorphosis of the soul of Cæsar. This was said to be visible in the presence of the sun."

It will be seen by the account of the comet of 1843, which follows, by Captain Benson, of ship Naples, of Salem, that so far as regards that comet he completely confirms the opinion of Mr. Arago; he not only *saw* the nucleus of that *body* but he measured *its* distance several evenings in the course of about three weeks, and measured its altitude more than once, and gives its size to have been about that of a star of the fourth magnitude.

COMET OF 1843.

It appears that the Comet of 1843, was first seen in the *day time*, at the town of Erivan, in Russia, on the 24th of February, three days before its passage of the Sun. There were living at that time, in different villages in the neighborhood of Erivan, many Germans, who twenty seven years previous, quitted their country, Wurtemberg, in order to go to the city of Jerusalem, believing that the end of the world was fast approaching. Allowing themselves however to be prevailed upon by reasonable representations to remain in Georgia, they joined other Germans who did not share in their religious enthusiam. During the twenty seven years of their remaining at these villages, their wealth and num-

bers increased, and many of them seemed to have forgotten their pilgrimage. Yet for a year or two past, their ancient religious desires began to revive in some of them. The prophesies of a distinguished family supported their zeal and enthusiam, and finally when the Comet appeared, they regarded it as a guide sent them from heaven, sold all their estates and refunded the Crown the advances they had received from it. The rich paid for the poor, the residue of their property was given to any individuals who presented themselves, and thus from three to four hundred persons, among whom were old men, women and children, set out without money, and on foot for Jerusalem, in the firm persuasion, that God would help them through all the dangers that threatened them in so long a journey in the midst of barbarous countries.

Well disposed people sought in vain to divert them from this disastrous resolution. But in their religious enthusiasm, the separatists disdained all advice. The fate of these unfortunate and deluded people, has never yet reached the writer.

The appearance of this Comet in the Heavens was announced to the people of the United States, by Captain Francis G. Clarke, of Portland, as seen by him on the 28th day of February, at 3h. 2m. P. M. bearing East by South $\frac{1}{2}$ S. 4°. 6′. 15″. distant from the Sun, which at that time had a Right Ascension of 22 hours, 45 minutes, and a declination of 7°. 58′. South.

Captain Ray, of a Nantucket Whale Ship, at the city of Conception, in Chili, on the 27th day of February, saw the Comet at 11 o'clock, A. M., of that day, at which time the edges of the Sun and Comet were distant from each other, apparently, about five miles. At the same time the Right Ascension of the Sun was 22 hours, 40 minutes, and declination 8°. 23′ South, and the Comet about 21 apparent miles distant East from the centre of the Sun, consequently the Right Ascension of 22 hours, 45 minutes, and declination of 8°. 23′. South, may be considered as very near the truth, as the situation of the Comet at that time.

By taking the Right Ascension and Declination of the Sun, on the 27th day of February, at the time seen by Capt. Ray, and the Right Ascension and Declination of the Comet, as communicated to the public by Messrs. Walker and Kendall, of the High School at Philadelphia, on the 9th April, being 41 days, the Comet had during that time made a course of N. 87 E., and travelled a distance of nearly ninety degrees in Right Ascension, during which time it made about 3 1-3 miles Northing per day.

There can be no error about the Declination of the Comet, at the time it was seen by Capt. Ray, as the Declination of the Sun was the Declination of the Comet, and the Declination on the 9th of April may be considered equally correct, by which and the Right Ascension the course and distance for 41 days, as above, were obtained and may be allowed to be correct.

It appears, however, that at the time Capt. Clarke made his observation, the Comet had acquired a distance of nearly fifty miles Southing, and further, from observations made at the High School in Philadelphia, and at Yale College in New Haven, both on the 11th of March,—communicated in the newspapers of the day,—that the Comet had reached a South declination of over eleven degrees.—These observations being considered as correct, go clearly to prove, that the course of the Comet from the 27th to the 28th of February, and for some days afterwards, was different from a direct course, from February 27th to April 9th, as in the former some degrees of Southing were made, whereas in a direct course Northing only was made.

It further appears, that the velocity from the 27th to the 28th of February, was much greater than the mean from 27th February to 9th April, as Capt. Clarke's observations were made nearly twenty-eight hours after those made by Capt. Ray. The distance during the elapsed time, according to Capt. Clarke's observation, was about four degrees, and allowing the Comet to be at the same distance from the Earth as that of the Sun, it would give a distance for twenty four hours of 5,657,000 miles, whereas the mean rate of travel for the forty-one days was about 2 1-5 degrees per day or 3,600,000 miles,—that of the first day exceeding that of the latter by two millions of miles per day.

I saw, in the newspapers of the day, many observations upon the Comet. That of Capt. Clarke's being the only one in the United States made with instruments, on that day, is considered of great importance, and together with those made at the High School in Philadelphia, and Yale College, at New Haven, has been selected for the above calculations and observations.

Since the commencement of the year 1845, I have received from Capt. Benson, of the ship Naples, of Salem, the following particulars of the Comet of 1843:

March 2d, soon after sunset, saw a remarkable streak of light in the West, resembling the Sun's rays. 3d. Cloudy. 4th. The streak of light seen on the 2d inst. is evidently the train of a large Comet—it set at 7 P. M. 5th. Cloudy, but could see 35° of the train very bright—it set at 8 P. M.—the Comet not yet seen. 7th. At 7 P. M. the Comet now in sight—its altitude 11° 11′, and the distance from the star Aldebaran 62° 09′—train 35° in length—distance from Sirius 85°, to which the

train directly tends. 8th. The sky remarkably red—at sun-set the train of the Comet, being only visible on account of clouds; but it is very bright, and has the *appearance* of being much nearer than last evening,

		° ′		° ′	° ′
10th,	Comet distant from Sirius	75 35	distant from Aldebaran	50 33	Altitude 19 08 at 7 P. M. very bright.
12th.	Do.	70 36	do.	47 55	
13th.	Do.	69 15	do.	46 16	
14th.	Do,	66 15	do.	44 11	Altitude 22° 43′ at 7 P. M.
17th.	Do.	61 00	do.	39 08	
18th.	Do.	57 35	do.	36 38	this night comet brighter than at any other time—length of train 44° 30′.
20th.	Do.	53 56	do.	35 50	

Arrived at Manila on the 28th, the Comet becoming more and more dim each evening;—on the 30th it had entirely disappeared.

By Capt. Benson's observations it is evident that the train measures different lengths at different times. Thus on the 7th it measured 35°, and on the 20th it measured 44° 30′. He states, and in this statement he is very particular, that the nebulous of the Comet appeared to have a diameter of about 16 miles—in the centre of which he saw distinctly the nucles or the comet itself, to which in every measured distance he carried the star; and that the Comet in size corresponded with a star of the fourth magnitude. During the time, about three weeks, in which these observations were made, the horizon was most of the time free from clouds, water smooth, and weather as pleasant as could be desired; and a better opportunity perhaps was never offered for the examination of a Comet, and satisfactorily proves what has been long doubted by astronomers, that a Comet is formed of "solid matter" and not "mere masses of vapour."

The following length of the train of the Comet, were communicated to the public through the newspapers of the day.

	° ′		° ′
Yale College, March 11, - -	40 00	Capt. Esling, Bark Globe, Philadelphia, April 5, lat. 3° N.	34 00
Amherst College, - - - - -	45 00		
Cecil County, Maryland, - - -	40 00	Valparaiso, March 18, - - -	48 00
W. Indies—H.M. S. Thunderer,	54 00	At Tahita, width of Train 4° -	51 00
Do. U. S. Brig Boxer,	53 00	Capt. Benson, lat 5° N. long 135 E.	44 30
Lat. 16 South, a person coming from India, - - - - -	38 00	Mean of the whole, - - -	44 45

Having the right ascension and declination of the Comet for the 18th of March, at midnight, at Greenwich, as communicated to the public from the High School at Philadelphia,—and the distance between the Comet and star Aldebaran having been measured by Capt. Benson in the evening of the 18th,—I have worked out its distance from its

then situation, and reduced it to the time at which Capt. B. made his observations.

Time of the ship March 18th, at 7 P. M. is in apparent time, the 18th,		7 hours
Longitude of the ship, being 135° East is in time, - - - - -		9 "
Corresponding to Greenwich time, - - - - - -	17th,	22 hours
Greenwich midnight being in time, - - - - -	18th,	12 hours
		14 hours.

so that Capt. Benson's time of measurement is 14 hours in advance of Greenwich midnight.

The whole work is here given, that any one having Bowditch's Navigator may go over it for his own satisfaction.

	° ′		° ′
Comet Right Ascension	42 22	Declination	9 15 S.
Aldebaran - -	66 45	Declination	16 12 N.
	24 23		25 57=1557 miles diff. latitude.
	60		
		Middle latitude -	12° 58′
Diff. longitude -	1463		

As the difference of lat	1557	Log 3 19229	As Radius 90° -		10 00000
Is to diff. longitude	1463	Log 3 16524	Is to diff. lat 1557 -	Log	3 19229
So is cosine of middle lat 12° 58′		9 98878	So is the secant of course 42° 29′		10 13225
		13 15402		Log	3 32454
		3 19229	of the distance 2111 miles, or 35° 11′ being the distance at Greenwich, midnight.		
To the tangent of the course N. 42° 29 E. - -		9 96173			

Capt. Benson measured the distance of the Comet to Aldebaran on the 17th, - - - - - 39° 08′

and on the 18th, - 36 38

Diff. - 2 30 in 24 hours

or 150 miles

If 24 hours give 150 miles—14 hours give 87 miles, or - 1° 27′

the distance as worked above - - - - 35 11

agreeing with the distance measured by Capt. B. on the 18th 36° 38′

While my Map was in the hands of the Engraver, the papers of the day, in communications from the High School at Philadelphia, and from Professor Perry, of the United States Navy, announced the appearance of two Comets in the Southern Hemisphere, seen by many with Telescopes, and by some with the naked eye.

The situation of the Comet of 1845, is placed upon the Map for January 11th, February 5th, and March 5th; and the place of Mauvais Comet is given for February 5th, at which time the two Comets were within about ten apparent degrees of each other.

Knowing that very many young persons leave school and enter upon the business of life, with a very inadequate, if any, knowledge of the elements of Astronomical Science, I have prepared this little work for their special use, and, I hope, benefit. I have had particularly in view, the case of those young men, who pass directly from the hands of the master of the school to those of the master of the ship, and at so early a period of life, that it has not been possible for the former to communicate such information as is contained in these pages;—information, which, as a shipmaster of many years experience, I feel warranted in saying will prove of the highest value to the young mariner. A very little patient application will enable any young person to acquire most thoroughly all that is imparted in these pages; and a careful study of the text, and of the accompanying Celestial Map, will give an amount of instruction in the science of astronomy, sufficient for all the purposes contemplated, and to obtain which might require the examination of many separate treatises. That my labors may lighten those of other students is the sincere desire of

J. P. FELT.

Salem, April, 1845.

Errata.—On page 19th, 15th line from bottom, for 37° 30′ S. read 17° 30′ S. On page 20th, 3d paragraph from top, for Mr. Beadley, Astronomer Royal, read Mr. Bradley.

A

MAP

Showing the situation of the Planets in their Orbits round the Sun

by

J. P. FELT.

Deed of Home.

Deed of Home.

Estate of Mrs. William D. Sargent.

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